of the trypanosome of sleeping sickness to man by *G. palpalis*. The discovery that the trypanosome of sleeping sickness persists and grows in *G. palpalis* is akin to the discovery of the development of the malaria parasite in the anopheles. The discovery of the transmission of the piroplasma of Texas fever, of East Coast fever, and of "biliary fever" in stock, by means of ticks, pointed the way to the discovery of the transmission by ticks to man of the spirillum of relapsing fever. There may be some reason to hope that the exhaustive investigation of the causes of grouse disease which is now in progress may possibly lead to a better understanding of the causes of appendicitis in the human subject. Many similar instances might be mentioned. But this is not the place for an essay on the recent history of bacteriology.

Much yet remains to be done. The cause of and specific remedy for blackwater fever, that scourge of tropical Africa, is still to seek. An effectual remedy for sleeping sickness still makes itself desired. Leprosy still baffles the investigator. No cure for bilharzia has yet been found. Prophylaxis for horse-sickness amongst horses, hitherto baffled by hæmolysis, has still to be discovered. (For mules a fairly satisfactory prophylactic has been found.) Piroplasma, for which, in dogs, a specific cure has been discovered, in horses and cattle still presents an unsolved problem.

But the future is full of hope. Such great strides in advance have been made during the last few years that no difficulty seems, to the investigator, to be insuperable. Perhaps the most interesting of the later developments is the discovery of a series of facts which point to the probability of the terribly fatal fever, hitherto called malaria, on the west coast of Africa, being really a form of yellow fever. This matter is now, or is shortly, about to be brought under exhaustive investigation; and should the probability turn out to be a reality, the adoption on the Coast of precautions similar to those which have proved so successful on the isthmus of Panama should render the Gold Coast as healthy as Barbados. Small wonder that an influentially signed address has been sent to the Memorial Committee, suggesting that the name of our beloved Sovereign, the late King Edward the Seventh, cannot be better commemorated than by a liberal endowment of the schools of tropical medicine, which in these later years have done so much for the promotion of bacteriological research and the prophylaxis and cure of tropical diseases, both in the United Kingdom and in the British Dominions beyond the seas.

THE MICROSCOPE AS AN OPTICAL INSTRUMENT.

Microscopy. The Construction, Theory, and Use of the Microscope. By E. J. Spitta. Second edition. Pp. xxii+502+xvi plates. (London: J. Murray, 1910.) Price 12*s.* 6*d.* net.

THE views expressed in the previous notice of this work which appeared in NATURE (February 6, 1908) would appear to have been amply borne out in the welcome accorded to it by the public, since a second edition has already become necessary. Continued use of the volume as a book of reference has thoroughly confirmed the original opinion formed as to its value for the purposes of the practical microscopist. While much more limited in scope than the classical work of Carpenter and Dallinger, being restricted to the consideration of the microscope as an optical instrument, it has from this point of view already largely superseded the older work. Dr. Spitta is fortunate, too, in having obtained, in dealing with the more theoretical portions of the subject, the assistance of Mr. Conrady, whose excellent mathematical knowledge has helped to keep the book free from any of the remarkable theories in connection with the microscope which have been put forward in recent years, and have even found acceptance from some skilled practical microscopists.

One of the features of the first edition of the book was that it was well up-to-date in the account given of present-day microscopes and microscope construction and accessories. There was thus the less necessity for changes in a new edition appearing after such a comparatively short interval. Nevertheless, besides the one or two more important additions of which mention is made below, advantage has been taken of the opportunity offered to include some of the most recent work. Old illustrations of microscopes by prominent makers have been replaced by others of the newest types, and descriptions of novel accessory apparatus are given. We note that the name of the Spencer Lens Co., of Buffalo, N.Y., now appears for the first time, their stand for critical work being fully illustrated, and attention is directed to their one-sixth objective with specially long working distance (1 mm.). A new sixth by Watson and Sons, and one by Reichert, with extra long working distance, are also mentioned. Illustrations of newer models by Zeiss, Beck, and Watson take the place of those previously given, and some forms of museum microscopes, with mechanical contrivances for bringing a series of slides successively into the field of view, are now described.

Among additional accessory apparatus may be mentioned the simple form of apertometer devised by Mr. F. J. Cheshire; new illuminators, especially the convenient miniature arc lamp by Leitz; Mr. J. W. Gordon's lamp with glass-rod light collector, and Mr. J. E. Barnard's mercury-vapour lamp for microscopists—very convenient, with screens, for obtaining monochromatic light; a new auxiliary stage by Watson and Sons; forms of gauges for measuring the thicknesses of cover glasses and slips; measuring oculars or eyepiece micrometers; and a simplified apparatus and method of preparing metallurgical specimens for microscopical examination. The last would appear to be outside the limits of the work, which does not deal with the extensive subject of the preparation of specimens. We have noted also a number of changes in the text, whether by way of omission of unnecessary matter, or additions to render explanations clearer. It is interesting that Dr. Spitta appears finally to have come to the conclusion, with reference to the "black dot" and "white dot" effects in pleurosigma, that "the better the combination (objective) the better the rendering of the black dot effect, no matter the appearance, within reasonable limits, of the white one."

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We would remark also that in his chapter on the "Theories of Microscopical Vision," Mr. Conrady adds a few paragraphs giving a short account of the connection between N.A. and the vision of minute objects of dimensions below the resolution limit, whether self-luminous or opaque.

The more important additions are those which deal with the extension of dark ground illumination to high powers, and the description of Siedentopf's apparatus for viewing ultra-microscopic particles. Dark ground illumination at high powers is obtained by the use of a condenser or illuminator of special type, which brings the light, usually with the aid of side reflection, to a focus on the specimen at a very oblique angle. Types of such condensers by Leitz, Zeiss, and Beck are described, and the method will no doubt be of value to the bacteriologist.

The Siedentopf method for illuminating ultra-microscopic particles is well known. The subject perhaps lies outside the range of the ordinary microscopist.

Finally, it may be mentioned that the already excellent series of photomicrographs has been extended by the introduction of four or five interesting photographs of amphipleura. Unfortunately, in the copy we have seen, the printers have made the mistake of printing the descriptive text on the wrong side of the thin paper separating the plates, with the result of making it somewhat difficult to read.

GEOMETRY OF SURFACES.

A Treatise on the Geometry of Surfaces. By A. B. Basset, F.R.S. Pp. xvi+291. (Cambridge: Deighton Bell and Co.; London: G. Bell and Sons, 1910.) Price 10*s.* 6*d.*

ACCORDING to his preface, Mr. Basset intends this book to supply a want in English works on solid geometry, namely, an adequate account of surfaces other than quadrics, the existing gap being due to the fact that Salmon's "Geometry of Three Dimensions" is now out of print.

The greater part of the book seems to be devoted to a detailed examination of the various types of singularities which can occur in surfaces of order not higher than the fourth; such a lengthy investigation cannot be properly criticised except at the cost of great labour. But, for reasons given below, it is doubtful if the method adopted for resolving higher singularities is really sufficient to do all that is claimed by the author.

It is not altogether clear, either, for what class of readers the book is intended; the greater part of the results will interest none but specialists in geometry. And one may imagine that such specialists might be tempted to ask why the analytical machinery is developed purely from metrical definitions, when the properties to be established are mainly projective (or descriptive) in character. Thus, *reciprocation* seems always to refer to a *sphere,* and *homogeneous coordinates* are defined (§3) only as *perpendiculars* on the faces of a tetrahedron. It is not quite easy to see how Mr. Basset would justify the use of coordinates such as $x+iy$, $x-iy$, on the last definition.

However, there is probably a wider circle of readers, not claiming to be geometrical specialists, who would take an intelligent interest in an account of the properties of cubic and quartic curves and surfaces, and particularly in results which are related to work in other subjects. Such readers might also find it useful to have information as to various models available for the illustration of the shapes of the figures; doubtless the expert geometer disdains these mental crutches, and relies on his powers of intuition. But those of us who confess to finding it difficult to visualise surfaces from their equations, are able to point to geometrical experts who have been led to unexpected results by the consideration of models; one need only mention Kummer's model of the surface of centres of an ellipsoid (Salmon, "Geometry of Three Dimensions," p. 273), and Henrici's models of movable hyperboloids. Even expert analysts may make slips in their work, and may find occasionally some difficulty in detecting such slips, while an examination of a diagram or model will often indicate the mistake at once. An illustration may be drawn from Mr. Basset's statement (§142) that the circles of curvature at the ends of the minor axis of an ellipse can intersect at points which lie on the circles of curvature at the ends of the major axis; a moment's glance at a figure will show that the former circles lie wholly *outside,* the latter wholly *inside* the ellipse, for all values of the eccentricity.

Those who wish for an introductory account of the simpler properties of cubic and quartic curves will find Mr. Basset's provision for them rather scanty. His theorems (and proofs) occupy but little more space than the summary (of results only) given in Pascal's "Repertorio," t. ii. (1st edition); and some of Pascal's references are omitted from the list (for cubic curves) given on p. 100. A good deal of light would be thrown on the classification of quartics of the first species by a reference to the Sylvester-Weierstrass method of invariant factors. The same method would prove useful in handling cyclides (quartic surfaces), and leading up to Darboux's pentaspherical coordinates; as Darboux's coordinates are not introduced at all, Mr. Basset is unable to prove that confocal cyclides cut orthogonally, and various other theorems given in Salmon's account of cyclides have to be omitted also.

Nor will the inquirer after the arrangement of the twenty-seven lines on a cubic surface fare much better. Mr. Basset gives half a page to proving their existence, and that of forty-five triple tangent-planes, but he has no illustration to give us of even the simplest example of a double-six. Details of the singularities of the twenty-three different types of cubic surfaces are enumerated; but we are not told that, say, the cubic with a nodal line (of the first kind) can be illustrated by the familiar *cylindroid,* models of which are amongst the commonest examples of ruled skew surfaces.

The resolution of compound singularities (chapters iv. and v.) is discussed first for the case of plane curves; the method appears in all cases to rest on the assumption (see, for instance, §165) that the most general singularity of order[1] p can be found on a curve

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[1] We have not succeeded in finding a precise definition of what Mr. Basset means by this term: it would seem to be a singular point with p tangents (some or all of which may coincide).

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